

Dominion Energy Nuclear Connecticut, Inc.  
Millstone Power Station  
314 Rope Ferry Road, Waterford, CT 06385  
DominionEnergy.com



U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

Serial No.: 21-382  
MPS Lic/DB R0  
Docket No.: 50-336  
License No.: DPR-65

**JAN 05 2022**

**DOMINION ENERGY NUCLEAR CONNECTICUT, INC.**  
**MILLSTONE POWER STATION UNIT 2**  
**LICENSEE EVENT REPORT 2021-002-00**  
**FAILED CHECK VALVE RESULTING IN UNANALYZED CONDITION AND OPERATION**  
**PROHIBITED BY TECHNICAL SPECIFICATIONS**

This letter forwards Licensee Event Report (LER) 2021-002-00, documenting a condition that was discovered at Millstone Power Station Unit 2, on November 6, 2021. This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(ii)(B) as an unanalyzed condition and pursuant to 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by technical specifications.

There are no regulatory commitments contained in this letter or its enclosure.  
Should you have any questions, please contact Mr. Jeffry A. Langan at (860) 444-5544.

Sincerely,

A handwritten signature in black ink, appearing to read 'JD' followed by a long, sweeping horizontal line.

John R. Daugherty  
Site Vice President – Millstone

Enclosure: LER 336/2021-002-00

IEZZ  
NRR

cc: U.S. Nuclear Regulatory Commission  
Region I  
2100 Renaissance Blvd.  
Suite 100  
King of Prussia, PA 19406-2713

R.V. Guzman  
NRC Senior Project Manager Millstone Units 2 and 3  
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NRC Senior Resident Inspector  
Millstone Power Station


Serial No. 21-382  
Docket No. 50-336  
Licensee Event Report 2021-002-00

**ATTACHMENT**

**LICENSEE EVENT REPORT 2021-002-00**  
**FAILED CHECK VALVE RESULTING IN UNANALYZED CONDITION AND OPERATION**  
**PROHIBITED BY TECHNICAL SPECIFICATIONS**

**MILLSTONE POWER STATION UNIT 2**  
**DOMINION ENERGY NUCLEAR CONNECTICUT, INC.**

NRC FORM 366  
(08-2020)



U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)  
(See Page 3 for required number of digits/characters for each block)  
(See NUREG-1022, R.3 for instruction and guidance for completing this form  
<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

APPROVED BY OMB: NO. 3150-p104  
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EXPIRES: 08/31/2023

1. Facility Name  
Millstone Power Station Unit 2

2. Docket Number  
05000 00336

3. Page  
1 OF 4

4. Title  
FAILED CHECK VALVE RESULTING IN AN UNANALYZED CONDITION AND OPERATION PROHIBITED BY TECHNICAL SPECIFICATIONS

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	Docket Number
11	06	2021	2021	- 002 -	00	01	05	2022	Facility Name	Docket Number
										05000
									Facility Name	Docket Number
										05000

9. Operating Mode  
N

10. Power Level  
000

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

<input type="checkbox"/> 10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	10 CFR Part 21	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	10 CFR Part 50	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	
<input type="checkbox"/> OTHER (Specify here, in abstract, or NRC 366A).				

12. Licensee Contact for this LER

Licensee Contact  
Jeffrey A Langan, Manager Nuclear Station Licensing

Phone Number (Include area code)  
(860) 444-5544

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS
B	SB	V	A585	Y					

14. Supplemental Report Expected  
☒ No ☐ Yes (If yes, complete 15. Expected Submission Date)

15. Expected Submission Date  
Month Day Year

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)  
On October 23, 2021 with the Unit Defueled, during a valve overhaul activity on the steam supply check valve, 2-MS-4B, to the turbine driven auxiliary feedwater pump, 2-MS-4B was found with its disc separated from the disc arm. This failure would have resulted in the check valve not preventing steam flow in the reverse direction and possibly preventing steam flow in the forward direction. The degraded valve was rebuilt. On November 6, 2021 an evaluation determined that this condition constituted an unanalyzed condition and a condition prohibited by Technical Specifications. On November 9, 2021 with the Unit in Mode 1 at approximately 89% power, 2-MS-4B chattering occurred. On November 14, 2021, 2-MS-4B was found to not be able to prevent reverse flow. Evaluation determined that each condition constituted an unanalyzed condition that could result in exceeding the containment design pressure in response to a main steam line break. Valve disk chattering caused the mechanical damage. A system alignment was established that reduced the valve chatter and a design change implemented a more robust valve disc retention mechanism. This report is being submitted as a condition that resulted in the unit being in an unanalyzed condition that significantly degrades plant safety per 10CFR50.73(a)(2)(ii)(B) and as a condition prohibited by Technical Specifications pursuant to 10CFR50.73(a)(2)(i)(B).

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Millstone Power Station Unit 2	05000-00336	2021	002	00

**NARRATIVE****1. EVENT DESCRIPTION**

During Cycle 27 (June 2020 – October 2021), 2-MS-4B (turbine driven auxiliary feedwater (TDAFW) B steam supply check valve) experienced occasional disc chatter following quarterly TDAFW pump surveillances on 11/2/2020, 1/27/2021, and 4/29/2021. Operations performed troubleshooting to reseal 2-MS-4B by isolating the valve and relieving pressure in the line upstream of the valve. Troubleshooting verified the check valve closed and chattering stopped with no additional actions taken. No chattering was observed until the next quarterly TDAFW pump surveillance. After chattering was observed following the 1/27/2021 surveillance and troubleshooting performed to verify the check valve was seated, an action was taken to pull up the scheduled performance of the preventative maintenance check valve overhaul on 2-MS-4B to the refueling outage in October of 2021. Following the 7/28/2021 TDAFW pump surveillance, no chattering was observed. Therefore, no troubleshooting was performed as no chatter was the expected response.

On October 23, 2021, at approximately 1624 hours, with Millstone Unit 2 in Mode 0, Defueled, 0 percent power, during the preventative maintenance check valve overhaul activity on the steam supply check valve, 2-MS-4B, the valve was found with its disc separated from the disc arm. The 2-MS-4B manufacturer is Trillium Flow Technologies (Originally Atwood and Morrill) and the manufacturer number is CSWA04DC001. This would prevent the check valve from performing its function to close. The failure of the check valve to close would have resulted in the blowdown of both steam generators during a main steam line break in the Steam Generator #2 main steam line upstream of the main steam isolation valves until the operators could isolate the faulted steam generator. The degraded steam supply check valve, 2-MS-4B, was rebuilt. On November 6, at approximately 1100 hours, evaluation determined that this condition constituted an unanalyzed condition that could result in exceeding the containment design pressure in response to a main steam line break. The Senior Resident Inspector was notified, and an 8-hour report was submitted pursuant to 10 CFR 50.72(b)(3)(ii)(B).

The impact of this condition on the valves ability to provide steam flow to the TDAFW pump was evaluated. On November 6, 2021, it was determined that it could not be conclusively determined that 2-MS-4B would be able to provide sufficient flow to the TDAFW pump. Technical Specifications require a feedwater pump capable of being powered from an operable steam supply system in Modes 1, 2, and 3. If the TDAFW pump is inoperable due to one steam supply being inoperable, the inoperable steam supply must be restored to operable status within 7 days or be in Hot Standby in the following 6 hours. Since it is likely that the steam supply was inoperable due to the damaged check valve for a period during operation longer than the 7-day allowed outage time, this condition represents a condition prohibited by Technical Specifications and is being reported in accordance with 10CFR50.73(a)(2)(i)(B).

On November 4, 2021, with the Unit in Mode 3, Hot Standby, all post maintenance testing for the repair of 2-MS-4B was successfully completed. On November 9, 2021 with the Unit in Mode 1 at approximately 89% power, chattering of 2-MS-4B was observed. Troubleshooting was performed but was unable to stop the valve from chattering. On November 14 chattering had stopped. On November 14 at 1127 the Technical Specification 7 day action statement for an inoperable steam supply was entered to support troubleshooting that was performed to verify the check valve was closed. Troubleshooting identified that a differential pressure (DP) across the check valve could not be established leading to a repeat determination of the November 6 evaluation that the valve would not prevent flow in the reverse direction. The Senior Resident was notified, and an 8-hour report was submitted pursuant to 10 CFR 50.72(b)(3)(ii)(B). Further investigation discovered degradation of 2-MS-4B valve internals. Engineering Change (EC) MP2-21-01174 was developed to redesign 2-MS-4B to incorporate a more robust valve disc retention mechanism to reduce failure potential

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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Millstone Power Station Unit 2	05000- 00336	2021	002	00

**NARRATIVE**

in the event the valve experiences chattering. After implementation of EC MP2-21-01174, chattering of 2-MS-4B was still observed. Additional troubleshooting discovered that 2 steam traps were leaking by. When the steam traps were isolated and a bypass line around 2-MS-4B was closed, overall chattering severity and frequency of 2-MS-4B was reduced.

Pursuant to station procedures an Alternate Plant Configuration was implemented to maintain the 2 steam traps isolated and the bypass line closed.

A 60-day report is being submitted to report that on November 6 and November 14, a condition existed that resulted in the nuclear power plant being in an unanalyzed condition that significantly degrades plant safety pursuant to 10 CFR 50.73(a)(2)(ii)(B). Additionally, on November 6, 2021, it was determined that the potential for the 2-MS-4B separated disc to block steam flow from the Steam Generator #2 main steam line through 2-MS-4B to the TDAFW pump could not be conclusively ruled out and is therefore being reported as an operation or condition which was prohibited by the plant's Technical Specifications pursuant to 10 CFR 50.73(a)(2)(i)(B).

**2. CAUSE**

The check valve disc was chattering which caused mechanical damage.

**3. ASSESSMENT OF SAFETY CONSEQUENCES**

The as found condition of 2-MS-4B resulted in the inability of the check valve to prevent reverse flow from the Steam Generator #1 main steam line in the event of a Main Steam Line Break (MSLB) in the Steam Generator #2 main steam line upstream of the main steam isolation valves. Additionally, the potential for the 2-MS-4B separated disc to block steam flow from the Steam Generator #2 main steam line through 2-MS-4B to the TDAFW pump has not been conclusively ruled out.

In the event of a MSLB in the Steam Generator #2 main steam line upstream of the main steam isolation valves with 2-MS-4B failing to prevent reverse flow, then the FSAR Section 14.8.2 MSLB analyses for the containment response would no longer be bounding. In this scenario, additional mass and energy releases from the intact Steam Generator #1 main steam line would continue until the operators isolate this steam flow path in accordance with the existing Emergency Operating Procedure guidance. This would result in an increase in mass and energy releases to containment with the predicted containment pressure exceeding the containment design pressure of 54 psig. While the containment design pressure would have been exceeded, the predicted peak containment pressure would be less than the containment lower bound failure pressure of 102 psig established in the Millstone 2 Individual Plant Examination.

In the event the 2-MS-4B separated disc blocked all steam flow from the Steam Generator #2 main steam line through 2-MS-4B to the TDAFW pump, the other flow path from the Steam Generator #1 main steam line through 2-MS-4A to the TDAFW pump was available. The steam flow path through 2-MS-4A to the TDAFW pump is adequate for the pump to perform its design function of delivering auxiliary feedwater to the steam generators in the event of a loss of all AC power (station black out) and for all FSAR Chapter 14 Safety Analysis scenarios, except for MSLBs in either main steam line upstream of the main steam isolation valves. In this MSLB scenario, the two remaining motor driven auxiliary feedwater pumps would be adequate to satisfy the reactor coolant system (RCS) decay heat removal safety function.

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**NARRATIVE**

A few unlikely 10CFR50 Appendix R fire scenarios rely solely on the TDAFW pump for RCS decay heat removal as the motor driven auxiliary feedwater pumps are postulated to be lost in a few specific scenarios. These fire scenarios utilize a disconnect switch to prevent the motor operated valve upstream of 2-MS-4B from inadvertently closing due to a hot short, ensuring a steam flow path to the TDAFW pump is available. In addition, there is procedural guidance to establish power to the auxiliary feedwater pumps from Unit 3. If we postulated the unlikely event that the 2-MS-4B separated disc blocks steam flow from Steam Generator #2 to the TDAFW pump, there is a fire in the area of the plant that causes a hot short that inadvertently closes the motor operated valve upstream of 2-MS-4A, and backup power cannot be established to the motor driven auxiliary feedwater pumps in a timely manner, then auxiliary feedwater would not be available for RCS decay heat removal and the potential for core damage could exist.

Based upon the above discussion, the safety significance of this failure is judged to be low.

**4. CORRECTIVE ACTION**

The valve was repaired during the refueling outage. After the second failure, troubleshooting was performed, and an alternate system alignment established which significantly reduced 2-MS-4B valve chatter. Engineering Change MP2-21-01174 was developed and implemented which redesigned 2-MS-4B to have a more robust valve disc retention mechanism to reduce the potential for valve failure. Additional corrective action will be taken in accordance with the Corrective Action Program.

**5. PREVIOUS OCCURRENCES**

There has not been a similar condition with main steam check valve disc separated from the disc arm at Millstone Power Station Unit 2 in the past 3 years.

**6. ENERGY INDUSTRY IDENTIFICATION SYSTEM (EIIIS) CODES**

SB Main Steam  
V Valve